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Consultancy Services for Basic Engineering, Detailed Engineering and PMC for Coal Discharge Jetty near Haldia Dock Complex

PROJECT DEFINITION REPORT

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	KOLKATA NEW DELHI MUMBAI

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1.0 Introduction

1.1. Background

Haldia Dock Complex (HDC), located at the confluence of river Hooghly and Haldi at about 125 Km downstream of Kolkata, was commissioned in 1977. HDC comprises of an impounded dock and three oil jetties and two barge jetties on river Hooghly. Ingress/egress to and from Impounded Dock System is regulated by one Lock Entrance and the lock operation is dependent on the tides. There are 14 berths within the impounded dock. HDC handles more of liquid, dry and bulk cargo and also containers at riverine jetties and at the berths situated inside impounded docks. At present Berth Occupancies within the impounded docks is very high resulting in high demurrages for the waiting vessels.

The shipping channel from Bay of Bengal to HDC is subject to heavy siltation. Even after carrying out maintenance dredging and river training works incurring huge recurring expenditure each year, there has been gradual deterioration in river draft in the approach channel that has imposed restriction on navigation of deep draft vessels. Accordingly, bulk carriers require substantial dead freighting before calling at Haldia and as a result, the end users are burdened with very high freight costs.

HDC envisages possibility of diversion of part coal from Dhamra through Haldia to take advantage of the following aspects:

- Inland transportation network connecting to different steel industries is very well established at Haldia and
- Mismatch of Port handling Capacity and cargo evacuation capacity presently available at Dhamra Port.

Although Cargo potential demands creation of new facilities, physical expansion of the dock by construction of additional berths would not fetch much benefit because vessel movements will be severely hampered due to the constraints of lock operation. Moreover, vessel movements are directly linked with availability of required tidal window.

1.2. Purpose of this report

HDC explores the possibility of handling Mini Bulk Carriers (MBC) of 10,000 to 12000 DWT directly at the river front after being off-loaded at Sand Heads/ Dhamra from the mother vessels to overcome the limitations of navigable channel. With this in view, HDC proposes to construct a riverine floating jetty in between 3rd Oil Jetty and Lock Entrance for unloading bulk cargo, predominantly coal, from MBC and barges ranging from 2000 to 5000T cargo. This will as well obviate the constraint of the lock system.

1.3. Scope of Consultancy Services

Haldia Dock Complex has awarded a contract in favour of Bothra Shipping Services Pvt. Ltd (BSSPL), the Lead Partner and Geo Services Applications Pvt.Ltd, Partner, through competitive bidding for installation, commissioning, operation, maintenance and transfer of Floating Jetty at up stream of 3rd Oil Jetty for handling Mini Bulk Carrier including construction of Hardstand, Road Network with mobile equipment for transfer of cargo, stacking and loading on wagon/truck inside G.C. Berth enclosure.

BSSPL appointed Jacobs Consulting Engineering Services Pvt. Ltd for rendering consultancy services under cover of letter no. 05102015/BSSPL-Vi/15-16/01-WO for Consultancy Services-CES dated 05th October, 2015. The scope of consultancy services is given below:

Scope

a. Review the existing soil, bathymetry and survey data, identify gap, if any, and establish requirement for fresh acquisition

b. Prepare data acquisition plan through primary sources and assist BSSPL in execution of data acquisition including coordinating/advising directly with specialized survey/investigation agencies on behalf of BSSPL to ensure swift acquisition of data.

c. Review, refine and finalise the basic concept plan developed by BSSPL

d. Prepare facility layout plan, material flow diagram with equipment brief and Project Definition Report

e. Reviewing of Project Definition

f. Preparation of Final Design Basis Report

g. Preparation of detailed design and construction drawing for the crane jetty on the basis of crane load details provided by crane manufacturer Leibherr

h. Preparation of detailed design and construction drawings for all offshore civil structures (crane jetty, hopper jetty, mooring dolphins) with sufficient strength to withstand loads as may be encountered while berthing a 10,000T Mini Bulk Carrier (MBC) and floating crane alongside the civil structures.

i. Preparation of basic and detailed engineering design for onshore civil structures including electrical substation, foundation for high masts, hardstand roads, drains and utilities as required.

j. Preparation of basic and detailed design for Approach trestle and catwalks

k. Preparation of basic design and engineering drawings for Electro-mechanical equipment and infrastructure

l. Preparation of civil and electro-mechanical works cost estimates based on the designs finalized

m. Review of designs provided by Civil and Electro-Mechanical sub-contractors and approving the same for construction

n. Deploying a team of qualified personal comprising Project Manager, Marine and Civil Structural Engineers, Geo-technical experts, Material Handling experts etc. as required

o. Monthly inspection for 8 months to monitor construction activities during the Execution phase (total 8 visits). Additional visits as required shall be on chargeable basis as per the man day rates indicated under Appendix 3 (sub para 1.3).

1.4. Organization of the Report

This report is being presented in ten (10) sections.

Chapter 1	Introduction
Chapter 2	Basic data
Chapter 3	Harbour Layout and Suggested Infrastructure
Chapter 4	Design Criteria

- Chapter 5 Preliminary Cost Estimate
- Chapter 6 Environmental & Social Issues
- Chapter 7 Evaluation of Alternatives, Conclusion & Recommendations
- Chapter 8 Project Implementation

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2.0 Development Plan

2.1. Terms of Reference of HDC

HDC has appointed BSSPL for Construction, maintenance and operation of a Floating Jetty at the upstream of 3rd Oil Jetty, fitted with crane, hopper, and conveyor system for unloading coal from 10000-12000 DWT Mini Bulk Carriers (MBC) on shore in the immediate vicinity and thereafter transfer to Dock area, stack and load on wagon and/or trucks including construction, maintenance of link road from Jetty to Dock, Fencing and related infrastructures required for the purpose. The Contractor shall ensure unloading of 10,000T coal per day as Minimum Level of Performance. After expiry of the Contract period of 15 years the Project will be handed over to HDC.

2.1.1. Basic Consideration

Because of present morphology of Hooghly Estuary, there is remote possibility of increasing river draft in the Auckland and Jellingham areas at the downstream of Haldia by dredging and River Training Works. However, there is potential for additional bulk cargo (Coal) through Haldia because of its well established hinterland connections. During the course of discussion held with HDC on 9th October, 2015, it emerged that at present Dhamra Port Handling Capacity is significantly more than its capability of evacuation. HDC has evaluated that unit cost of transportation of such left over cargo by dispatch in small parcels commensurate with available river draft from Dhamra Port through Haldia to the respective end users would be beneficial to them.

With that HDC invited tenders for carrying out cargo unloading operations from MBC, transport, stack and load on wagon/truck as the case may be on BOT basis for a period of 15 years. The Contractor for cargo handling operation shall have to ensure Minimum Level of Performance of 10,000 T per day. During the discussion it further transpired that HDC will be responsible for arranging cargo vessels at the Floating Jetty and also rake at the G.C. Berth siding and the cargo handling Contractor shall only be responsible to unload vessels ensuring MLP and also loading of rakes within free time granted by Indian Railway, otherwise damages at the defined rates specified in the Tender shall be levied.

2.1.2. Proposal Description

Facility Lay Out of the Floating Jetty given in the Tender Drawings by HDC consists of the following:

- Anchoring floating Pontoon of 70M x 25M X 3M having 1.8 M draft on the river at about 60 M form the bank.
- One CBJ 300 of Liberre capable to handle 19.8 MT per cycle with 22 CBM grab with 28 M extended boom is to be mounted on the centre of the pontoon.
- One Hopper with vibro feeder of 600T per hour capacity is also to be mounted eccentrically on pontoon.
- Provision of Two 1.5 M wide Approaches on either side of Conveyor alignment is conceived. First 60 M of the Approach Way rests on pile supports at same level of bank and last 20 M rests over pontoon on roller on one end and on pile cap with yoke arrangement at the other end to adjust to the tidal variations.
- Alignment of 1.2 M wide conveyor gallery originating from below hopper on the pontoon to pile cap is shown inclined with the alignment from pile cap to the shore. During high tide, level of the conveyor from the hopper is shown above the level of

the pile cap i.e. sometime in a day this portion of the conveyor will be on reverse slope.

2.1.3. BSSPL Proposal and Discussion on Pros and Cons

BSSPL in the meeting held on 9th October, 2015 at Haldia informed Jacobs that the scheme attached to the tender had the following severe drawbacks for which the scheme was considered not workable:

a. In river Hooghly having large variation of tides unloading operation from vessel/barge is proposed using heavy duty crane and hopper with vibrofeeder installed on the same floating pontoon.

b. The alignment of feeder conveyor from the hopper on pontoon is shown at an angle with the alignment of the backup conveyor for discharge on shore without any Transfer Tower and/or supports. Besides, vertical angle of the feeder conveyor will be continuously varying depending on tide and on some occasions feeder conveyor will be inclined upwards with respect to the backup conveyor alignment at the meeting point.

BSSPL submitted revised facility lay out plan for ship handling maintaining water front area as per tendered scheme of HDC prior to award of Contract and gave presentation before the Board of Trustees to justify the workability of the revised scheme prepared by them. The Contract was awarded after BOT approved the revised lay out.

In the context of revised lay out submitted by BSSPL, HDC clarified that BSSPL is free to decide on providing fixed structures supported on piles for installing crane, hopper, conveyor, dolphins for mooring vessel/pontoon up to the berthing line shown in the Tender Drawing.

As regards current bathymetric survey plan at the Project Site, HDC confirmed that bathy survey at the location of the proposed jetty would be carried out on 15th October, 2015 and surveyed plan would be forwarded to BSSPL immediately thereafter. HDC would also provide the coordinates of the proposed jetty.

BSSPL informed that order for procurement of Cranes was on the verge of completion and dimensions and loadings from crane under different scenarios would be transmitted to Jacobs shortly.

Jacobs requested for topographic plan of the land area for finalizing layout plan of shore facilities. BSSPL informed that topographic plan would be submitted by 17th October.

2.2. Concept of Contractor

2.2.1. Basic Consideration

Basic Consideration of BSSPL proposal is to operate vessels including discharge of cargo and transfer to shore should be from fixed platform instead of floating platform. Further, alignment of conveyor gallery should not have any bend, nor depends on the tidal fluctuation of the river. BSSPL also considers to cover same water front area as per tender drawing. Besides, as per study carried out by BSSPL, range of fleet likely to call at Haldia Floating Jetty would be 2000-5000 T sea going barges.

2.2.2. Project Description

BSSPL proposes to install crane and hopper on separate fixed platforms to operate vessel independent of tide. A pontoon of about 47mx24m will be anchored at the berthing line. Another crane will be installed to supplement the main crane to cover cargo hatches of the vessels and other ancillary works as required. A 3.5m wide walk way is proposed to connect hopper deck with the shore. For anchoring vessels installation of mooring dolphins with connected walkways are proposed.

2.2.3. Pros & Cons

The Concept Plan submitted by BSSPL has been reviewed and some modifications are considered necessary.

3.0 Project Proposal

3.1. Project Site

Site reconnaissance and topographic survey report reveals that the land use of the area identified for the shore facilities is generally low-lying. There is no habitation within the identified area. However, Haldia Bhavan – WB Govt. Circuit house and Tourist Lodge is located towards north-west corner of the site. Jawahar Tower - Administrative head office of HDC is located towards north – west within 750m of the proposed site. Entire land is within the control of HDC. Topographic survey map with the land boundary identified for the development has been presented in Figure No. 01. (Pending).

3.2. Facility Layout

Layout of the jetty has been proposed based on the scheme forwarded by BSSPL superseding the layout given in tender drawing. Proposed project site with facility layout has been presented in Figure No.02. Salient features of the facility layout are given below seriatim:.

a. Main crane and hopper with vibrofeeder are proposed to be installed on fixed RCC Deck supported on steel piles. The deck level is proposed at + 8.70m CD to take care of HATL, Storm Surge and Freeboard.

b. Conveyor gallery from hopper to on shore storage area in the immediate backup area of the Jetty will run parallel to the main Approach Way and elevation of discharge point will be + 20.00m CD. Thus the inclination of conveyor will be 7^0.

c. A 3.5 m clear width RCC Approach Way will connect RCC hopper deck with the shore to facilitate movement of pay loader, spares for equipment, provisions for the vessels etc.

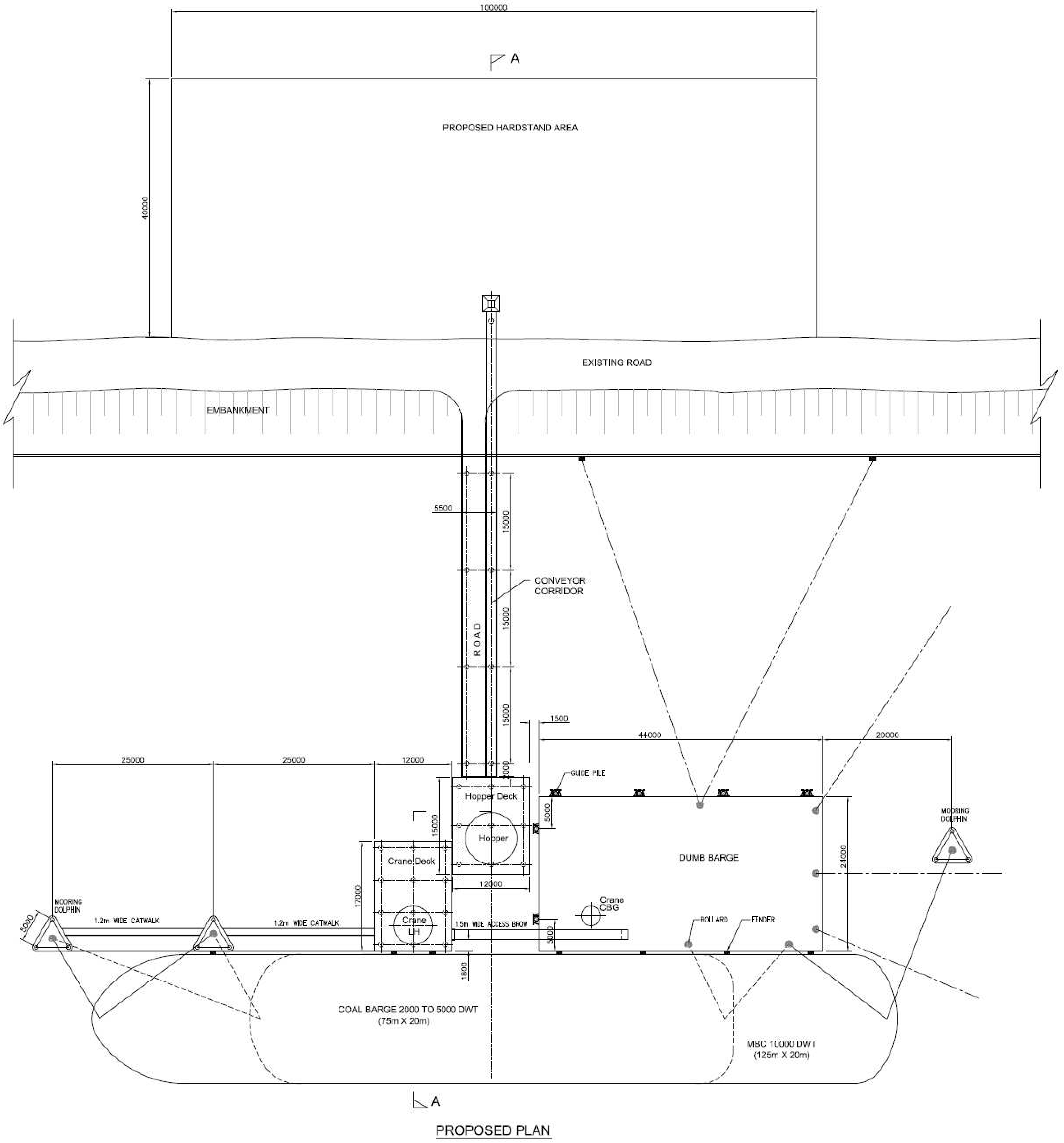
d. A 47 M x 24 M steel pontoon mounted with another crane will be placed along berthing line alongside main hopper platform. A steel walkway (ramp) connecting crane platform deck with pontoon is proposed for movement of crews/workmen.

e. Crane platform deck and pontoon will be provided with adequate fenders for berthing of vessels/barges up to MLWL with due provision to protect piles of the crane deck against hitting by the barges,

f. RCC dolphins fitted with bollards and connected walk ways are proposed for mooring barges/vessels and floating pontoons.

g. Adequate number of steel pipe piles for guiding and holding the pontoon.

.It will be seen from Figure No. 02 that for the proposed layout gross area of the facilities on water front is 1862 sq. m as against about 1950 sq. m as per tender drawing of HDC Cross-Section, Front elevation and Steel Ramp connecting Crane Platform Deck and Pontoon of the Floating Jetty showing the major facilities for the development has been presented in Figure No. 03 to Figure No. 05.

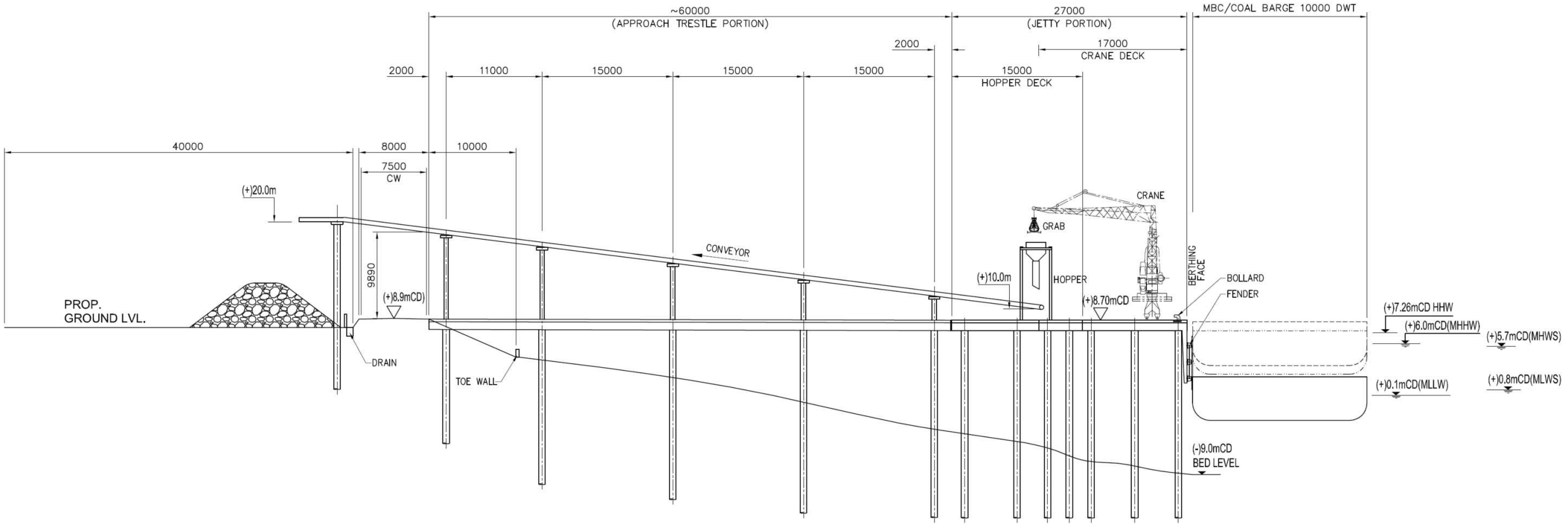


PROPOSED PLAN

GROSS AREA ON WATER FRONT

PONTOON:	1128 sqm
HOPPER DECK:	180 sqm
CRANE DECK:	204 sqm
WALKWAY:	100 sqm
APPROACH WAY:	217 sqm
MOORING DOLPHIN:	33 sqm
TOTAL:	1862 sqm

FIGURE No - 02
FACILITY LAYOUT OF FLOATING JETTY AT HALDIA
Client- BSSPL
JACOBS CES



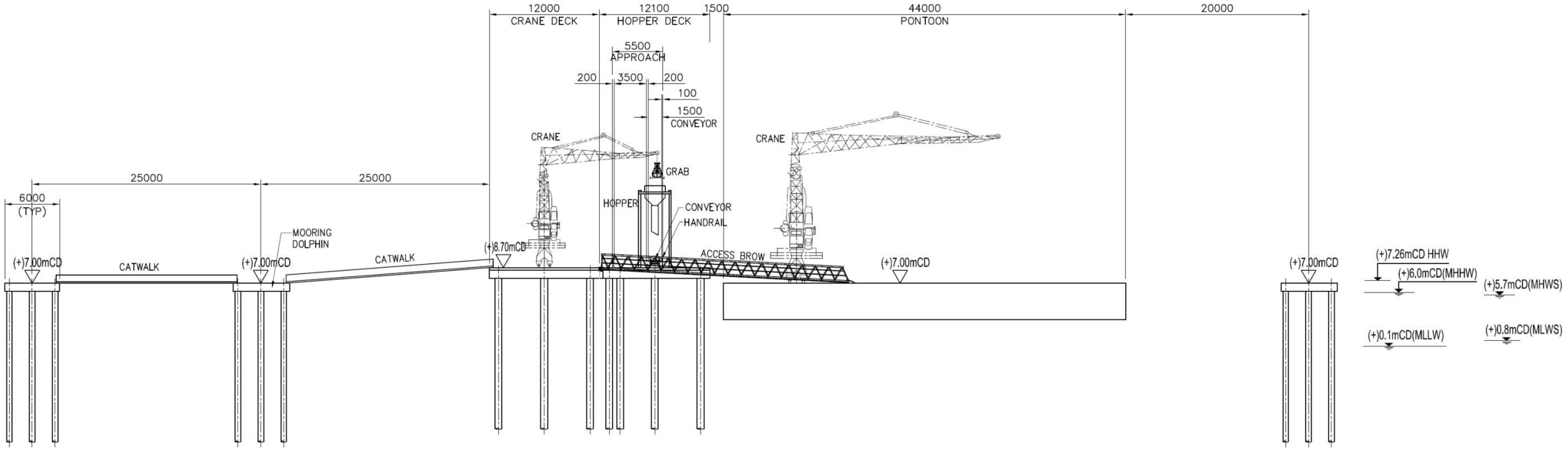
SECTION A-A

FIGURE No - 03

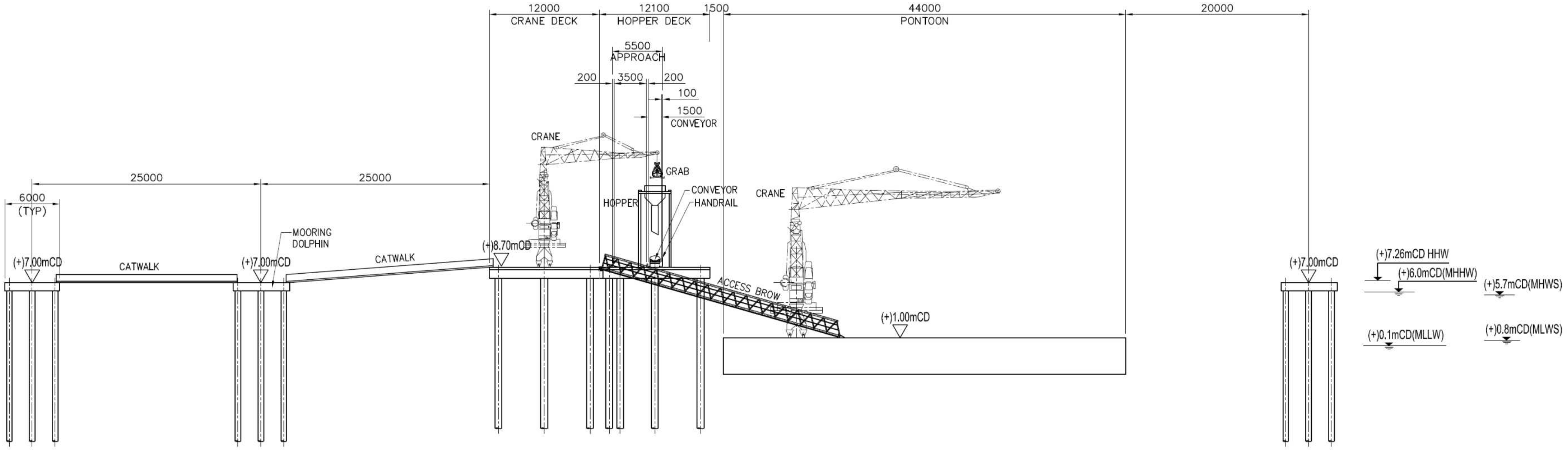
CROSS SECTION OF FLOATING JETTY AT HALDIA

Client- BSSPL

JACOBS®CES



ELEVATION IN HIGH TIDE CONDITION



ELEVATION IN LOW TIDE CONDITION

FIGURE No - 04

FRONT ELEVATION OF FLOATING JETTY AT HALDIA

Client- BSSPL

JACOBS CES

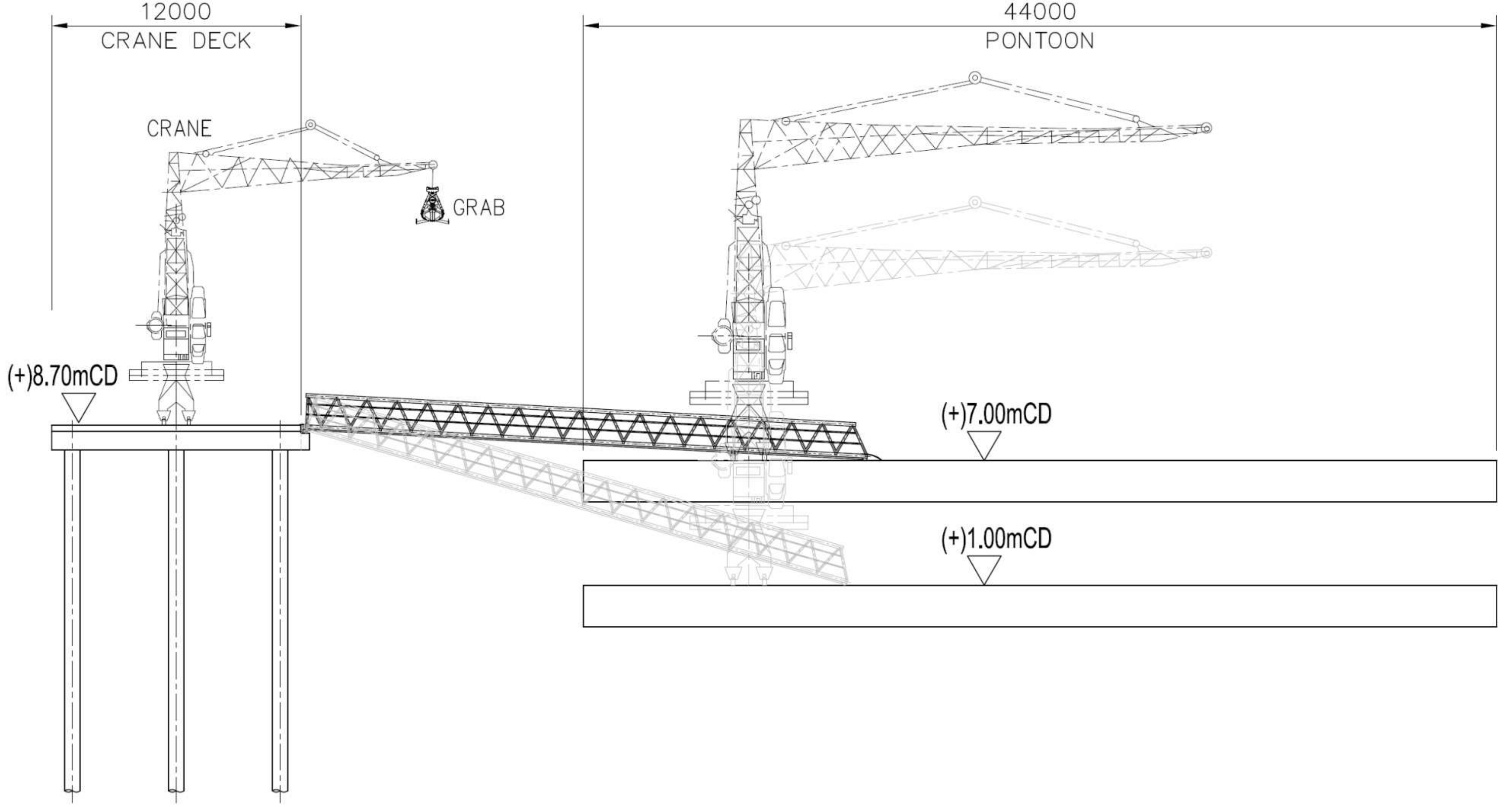


FIGURE No - 05
RAMP FROM CRANE DECK TO PONTOON
Client- BSSPL
JACOBS® CES

3.3. Water Front Facility

3.3.1. Design Vessel Size

In accordance with the TOR Mini Bulk Carrier of 10,000 DWT has been considered as design vessel size. Fully laden draft of the design vessel is ranging between 7.5 m to 8.0 m. Considering the present level of water depth available in the approach channel fully laden MBCs can only be called at the Floating Jetty during high spring tides.

The broad characteristics of MBC considered for design is mentioned below:

DWT: 10,000, Parcel Load: fully laden, LOA: 125m, Beam: 20m, Draft: 7.5m.

3.3.2. Water Area

Width of the berthing area should not be less than 1.5 times of the beam of the vessel. Providing a keel clearance of 0.75m to 0.80m river bed level of the berth pocket in front of the berth should be in the region of -8.50.m CD for a width of 30m.

3.3.3. Water Depth

(On receipt of recent Bathy Chart this paragraph will be finalised)

3.3.4. Jetty Location & Alignment

Floating Jetty shall be off shore type and its alignment has been kept at 63^0N following the recommendation of the mathematical model study in connection with DPR prepared by CES for Construction of a Multipurpose Riverine Jetty at the immediate upstream of 3rd Oil Jetty at Haldia of HDC. (The coordinates of the proposed jetty will be incorporated in the layout on receipt of the same from HDC/BSSPL). This berth will be connected to the land by means of one 3.5m wide approach trestle up to hopper deck platform.

3.4. Cargo Servicing

3.4.1. Cargo Handling

As per TOR of the tender, crane with 28m extended boom fitted with 22 cu. M grab will be installed. In addition another crane will be provided on pontoon deck to complement the main crane.

3.4.2. Jetty Capacity

As per TOR, minimum ship day output shall be 10,000 T per day. Considering 70% Berth Occupancy Jetty Capacity will be 0.7x365x10,000 = 2.55 MTPA.

3.4.3. Cargo Storage

An intermediate storage yard of 4000 sq. M area will be developed with high density interlocking type pre-cast block construction capable to sustain cargo load corresponding to 50 MSA. as hard stand at the immediate backup area of the Jetty for stacking of cargo by unloading from the barge/vessel.

3.5. Basic Infrastructure

Basic infrastructure covering that stated in TOR has been proposed. Salient proposal of the listed basic infrastructure are as below:

3.5.1. Land Development

(This Para will be suitably addressed after receipt of Topographic Plan of the Project Boundary)

3.5.2. Boundary Wall & Gate

Boundary wall has been proposed along the periphery of the proposed site. It is however necessary to redefine the boundary of the dock area and considered this area within the dock boundary from better operational consideration. Solid boundary wall of height 2.70m with 1.10m barbed wire/concertina wire on top has been proposed along the periphery of the boundary. (Total length of the wall and number of gates will be assessed after reviewing the topographic plan).

3.5.3. Electrical Sub-Station

A Sub-Station is proposed for housing electrical instruments and machineries for receiving power from HDC source and further distribution for operating cranes, vibrofeeder, conveyor, illumination, water supply etc.

3.5.4. Internal Road

Road network inside the boundary wall has been provided to ensure smooth flow of traffic. 1.30 km length of road with carriageway width of 10.5 m has been proposed. All the roads are of high density interlocking type pre-cast block construction capable to sustain traffic load corresponding to 50 MSA.

3.5.5. Drainage, Water Supply & Sewerage

A network of surface drains is considered to drain off the surface run-off with catch pit for every 400 sq. m. area. Based on the water demand analysis, connection with HDC water supply network with downstream distribution system will be designed. For sewage treatment packaged treatment plant has been proposed

3.5.6. Environmental Mitigation Measures

This aspect has been dealt with in a separate Chapter.

4.0 Design Criteria

4.1. Design Standard

The design standards in this project have generally been on the standard of BIS Code of Practice as well as guidelines provided by BSSPL and HDC for this particular project. In absence of any specific guidelines on the above, sound engineering practice and/or Consultants experience and/or recommendation to fulfill the project requirement and bridge the gap in guidelines/ standard have been followed.

4.1.1. Environmental Data

Rainfall Data

This region is mainly exposed to south-west monsoon from June to September and an average monthly rainfall of over 250mm is experienced (July and August are the wettest months having monthly rainfall as high as 400mm). During north-west monsoon from November to February monthly average rainfall of less than 50mm is experienced. The average annual rainfall is around 1500mm and the average number of rainy days in a year with rainfall of 25mm or more is about 20.

Temperature

In Haldia, there is a seasonal variation in the temperature. April and May are hotter month whereas December and January are colder months. The highest temperature so far recorded is 44.90C during the month of May in 1975 and the lowest temperature is 6.90C recorded during the month of December 1975. Design range of effective temperature is ± 250C

Visibility

It is learnt that visibility at Haldia is better compared to Kolkata as the area is free from industrial smoke. At times due to heavy rainfall poor visibility is reported during the south-west monsoon. On an average fog is reported on 5-7 days in each month from November to February during mornings.

Wind

For the purpose of design of the berth, wind loads have been considered with the following wind velocities.

Basic wind speed = 50m/sec

Wind speed in operating condition = 20m/sec

Earthquake

Seismic loads are estimated according to modified clause for the interim measures for seismic provisions clause 7.5.3 of IS 1893 (Part 1): 2002

Horizontal seismic forces to be resisted shall be computed as follows

VB = A h x (Seismic weight of structure)

A h = {(Z I/2 R) x (Sa / g)}

Horizontal Seismic Co-efficient = 0.15

Z = Zone Factor = 0.24 (Table 2 of IS 1893)

Sa / g = Average response acceleration coefficient = 2.50 (Fig. 2 of IS 1893)

R	=	Response Reduction Factor	=	3.0 (Table 7 of IS 1893)
I	=	Importance Factor	=	1.50 (Table 6 of IS 1893)

Tidal Data

The tide levels of river Hugli at Haldia are as follows

Highest High Water (HHW)	(+) 7.26 m CD
Mean High Water Spring (MHWS)	(+) 5.70 m CD
Mean High Water (MHW)	(+) 5.01 m CD
Mean High Water Neaps (MHWN)	(+) 4.26 m CD
Local Mean Water Level (LMWL)	(+) 3.23 m CD
Mean Low Water Neaps (MLWN)	(+) 2.10 m CD
Mean Low Water (MLW)	(+) 1.34 m CD
Mean Low Water Springs (MLWS)	(+) 0.80 m CD
Lowest Low Water (LLW)	(-) 0.07 m CD

Wave & Current

Flood tide current of 6 knots has been considered based on the data available from the model study report of CWPRS.

4.1.2. Level Data

Levels of the proposed jetty has been proposed as below

- Design Deck Level : (+) 8.70 m CD
- Design Dredge level : (-) 9.0 m CD
- Design Scour Level : (-) 12.0 m CD

Regular monitoring of scour level is considered necessary to provide suitable protection scheme with the jetty structure to limit the scour level.

4.1.3. Load Data

Dead Loads

The following unit weights have been used in the design to assess dead loads i.e. permanent loads due to the self weight of the structure.

- Reinforced concrete : 24.0 kN/m^3
- Structural Steel : 78.5 kN/m^3
- Water density : 10.0 kN/m^3

Live Loads

To be incorporated based on data from BSSPL.

Hydrodynamic & Hydrostatic Loads:

The flood tide current of 6 knots = 3 m/s (approx.) has been considered based on the data available from model study report by CWPRS.

Wind Load

Loads due to wind are estimated as per IS 875: Part 3

The port is situated near Calcutta and hence the basic wind speed is taken for Kolkata as 50 m/sec.

Design life of structure = 20 yrs.

Berthing Loads

Berthing force has been evaluated for the berth as per clause 5.2 of IS 4651 (Part III) for vessel size of 10,000 DWT.

Mooring force has been considered as per table 4 of the IS 4651 (Part III). Bollard pull of 60 tons has been considered for 10000 DWT.

4.1.4. Load Combinations

Load combinations have been considered as per IS: 4651 – Part (IV) and are as presented in Table 4.1

Table 4.1 : Load Combinations

Type of Loading	Load Cases								
	Limit State of Service		Limit State of Collapse						
	I	II	III	IV	V	VI	VII	VIII	IX
1. Dead Load	1.0	1.0	1.5	1.2	0.9	1.2	0.9	1.2	0.9
2. Live Load	1.0	1.0	1.5	1.2	0.9	1.2	0.9	1.2	0.9
3. Hydrostatic & Hydrodynamic	1.0	1.0	1.0	1.2	1.2	1.0	1.0	1.0	1.0
4. Berthing & Mooring Force	1.0	1.0	1.5		1.5				
5. Seismic Force								1.5	1.5
6. Wind Force						1.5	1.5		

4.1.5. Geotechnical Data

Geotechnical data for the berth structure has been considered based on the sub-soil investigation report of U/S 3rd oil jetty project. Generalized soil profile from the aforesaid report, as considered for the design of piles has been presented in Table 4.2.

Table 4.2 Generalized Sub-soil Data considered for Berth Design

Sl. No.	Description	RL (m)		Thickness (m)	Average Field N Value	Bulk Density t/m^3	Strength Parameters
		From	To				
I	Grey soft/firm silty clay	-3.9	-16.5	12.6	4	1.7	C = 2.3 t/m^2
II	Grey to bluish grey silty sandy clay / Silty Clayey sand	-16.5	-23.0	6.5	9	1.93	C = 7.1 t/m^2
III	Medium dense Yellowish brown silty fine sand	-2.3	-31.0	8.0	26	1.815	-
		-31.0	-55.5	24.5	45	1.815	-

Considering the length of berth vis-a –vis the available sub-soil data, confirmatory boring at maximum interval of 25m is imperative during construction stage for finalization of founding level of piles.

4.2. Material for Construction

- Pile Construction : RCC bored concrete pile and Steel Pile both option has been considered for the design. The same has been evaluated based on the Technical and cost criteria for final selection.
- Berth Superstructure : Reinforced Concrete construction with concrete grade M 40 and reinforcement grade Fe 415 / Fe 500.
- Pavement : M 50 grade pre-cast block pavement within the back-up area. Bituminous construction for the essential road connectivity.

4.3. Design Codes & Standards

The following design codes are used in the design of various components of jetty.

IS-4651 Parts 1 to 5 : Code of Practice for Planning & Design of Ports and Harbours

IS 2911: 2010 : Design of Pile Foundation

IS-800 -2007 : Code of Practice for General Construction in Steel

IRC: 6 - 2014 : Code of Practice for Roads & Bridge Loading

IS 1893 (Part 1): 2002 : Criteria for Earthquake Resistant Design of Structure

IS: 875-1987 Parts 1 to 5 : Code of Practice for Design Loads

IS 456: 2000 : Code of Practice for Plain and Reinforced Concrete

BS-Manual : The Structural Design of Heavy Duty Pavements for Ports & Other Industries

4.4. Preliminary Design

4.4.1. Crane Jetty / Hopper Jetty / Conveyor Gallery & Approach Road

The 3-D modeling of the structure and Structural analysis is carried out with STAAD-Pro software . The piles are designed in Ultimate Limit state for axial load and flexure and checked for Limit state of Serviceability.

4.4.2. Hard Stand & Access Road

Interlocking Concrete (M 50) block pavement has been proposed for the yard. Basic considerations of the design are as below

- Sub grade CBR of 10%
- Design life of 30 years
- Number of passes 50 MSA

4.5. Material Handling System

From the discussion Jacobs had with HDC and BSSPL on 9th October, 2015, it revealed that proposed Floating Jetty would be used for unloading coal from barges of parcel loads between 2000 to 5000 T. However, the jetty along with unloading facilities should be designed to cater to fully laden Mini Bulk Carrier of around 10,000 DWT. The broad dimensions of MBC and Barges considered are given below.

Ship Detail	LOA (M)	B (M)	Draft (M)
MBC	125	20	7.5
BARGE	75	20	3.5

CBJ 300 crane of Liberre make will be installed on a fixed deck. The centre line of the crane will be located at 3m from the edge. With the boom outreach of 28m radius, this crane will be able to cover entire width and major portion of the length of the MBC/Barge. Another crane is proposed to be installed on the floating pontoon to supplement the main crane.

Hopper with vibrofeeder will be installed on a separate fixed deck at a location within the convenient reach of both the cranes. Conveyors will be fitted at the bottom of the hopper for transfer of coal. The shore cranes will unload coal from MBC/Barge and discharge on the conveyors through hopper. Coal will be transported and openly discharged by the conveyor system on the designated storage yard at the immediate back up area.

Crane Details:

Grab Capacity: 22 m3 / 19.80T (20.0T), Density of Coal: 900 kg per m3

Boom: 28m with extended boom;

Cycle Time of Unloading: 2 minutes, i.e. 30 moves per hour

Rated Unloading Capacity: 300x20=600T per Hour

Belt Conveyor Details

Rated Discharge Capacity: 600 T per Hour

Belt Width: 1200 mm

Transition Idler Inclination: 350

Length: Approximately 80 M

Conveyor Inclination: 50 to 70

Elevation at the discharge point: + 21.0M

4.6. Electrical System

Power supply at 3.3KV, 3 Phase, 50Hz will be received from the substation of HDC at Third oil Jetty which is 1KM away from licensed area by 3.3KV XLPE cable. It is roughly estimated that 1500 kv power will be required for operation, illumination and other ancillary purposes. An indoor substation and electrical control room will be constructed in the licensed area to feed the following connected loads:

a) Crane CBW 2640

b) Crane CBG 300

c) Belt Conveyor

d) Vibratory Feeder

e) Illumination and high mast lighting

3.3 KV supply will be received at substation by VCB. Then 3.3 KV will be transformed to 433 Volts by ONAN transformer. Outgoing from transformer will be fed to LT switchgear having ACB as incomer and MCCBs for outgoing feeders.

4.6.1. Scope of Electrical Work

Scope of Electrical work shall include preparation of electrical design & drawing, supply, installation, testing and commissioning of following equipment as per relevant electrical standard and as per approved technical specifications/ drawings. Total job, supply, and erection& executed under this contract including system design and detailed engineering, shall comply with the statutory requirements and local regulations. The scope of work includes obtaining necessary statutory approvals/clearances from all the concerned authorities for various systems covered in this specification.

The major items covered under the power distribution system are as follows:

- 3.3KV switchgear completes with all relays, instruments, VCB, meters, indication lamps, etc.
- 3.3/.433KV power transformer with required capacity complete with all fittings and accessories.
- Lighting transformer of required capacity, complete with all fittings and accessories.
- Emergency power supply (D.G. set)
- LT switchgear having ACB as incomer and MCCBs for outgoing feeders complete with. relays, instruments, meters, indication lamps, etc. Spare outgoing feeders will be provided.
- Power factor improvement system
- HT & LT power cables and control cables with required accessories for laying of cables.
- Indoor & outdoor Lighting system, LDBs, Junction Boxes, Lighting Panels, lighting poles, high mast lighting, light fixtures of various types, switch socket outlets, cables, wires, GI conduits with all accessories,
- System earthing as per IS3043 and lightning protection system as per IS2309 complete with all necessary items.
- Fire detection system
- Pressurization system.
- Conveyor motor and protection switches.